

Summary

Westport Waterfront TOD - Cost Benefit Analysis

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Proposed Infrastructure Improvements

The City of Baltimore Department of Transportation (Baltimore DOT), in partnership with the Maryland Department of Transportation (MDOT) request \$16.28 million in Transportation Investment Generating Economic Recovery II (TIGER II) funds to complete the funding package for a \$39.8 million project that will repair and enhance a network of roads, bridges, railroad crossings, transit stations, and shared-use trails necessary to support the \$1.2 billion Westport Waterfront Transit-Oriented Development (Westport Waterfront TOD), including:

- Replace structurally deficient, functionally obsolete bridge elements at three major MD 295 interchanges including a pedestrian bridge
- Improve signalization, turn-lanes, and bike and pedestrian facilities along Annapolis Road and Waterview Avenue to reduce congestion and enhance pedestrian accessibility
- Construct John Moale Boulevard providing two travel lanes, two parking lanes, wide sidewalks and a 16' wide dry swale system to access the 19 development parcels within the TOD
- Build a pedestrian bridge connecting the TOD to an existing Light Rail station
- Replace an unsafe and deficient on-street bike lane with a two-mile off-road extension of the 15-mile Gwynns Falls shared use trail
- Ensure safety along an active freight line by adding new safety measures at three at-grade crossings and building a pedestrian overpass

Westport Waterfront TOD Area

Westport Waterfront is being designed as a mixed use/walkable/transit-oriented development (TOD) community, consistent with sustainable development principles. Set on the shores of the Middle Branch of the Patapsco River, Westport will offer residents and businesses a model green community with immediate access to both Baltimore's light rail system and the Gwynns Falls greenway/hike/bike trail system.

Westport Phase I. The TIGER application is proposed to fund the major infrastructure improvements needed to facilitate Westport Phase I. Phase I will provide 4,000 jobs in an exciting mix of:

- 796 residences
- 900,000 sq ft office space
- 91,500 sq ft retail space

The design will maximize sustainable development objectives – the plan is being submitted for LEED-ND platinum, and individual buildings will meet a minimum of LEED silver. Densities are very urban – about seven times typical suburban densities, with one result being that the entire Phase I development area is within ¼ mile of the Westport Light Rail station. Extensive internal walking trails will link to the City's 22-mile Gwynns Falls Greenway.

Westport Phase I is strongly linked to the proposed TIGER infrastructure improvements. With property assembled, land prepared and cleaned up, development plans approved, and vertical development imminent, Westport Phase I has the strongest possible contingent relationship with the proposed infrastructure improvements.

Longer term Development - Westport Phase II and Middle Branch Corridor. While not counted in the cost-benefit analysis, there are substantial, even transformative, long range plans that the proposed TIGER improvements will assist.

In 2008 Baltimore finalized the Middle Branch Master Plan, available at http://www.middlebranchbaltimore.com/Portals/0/MiddleBranchMasterPlan_full.pdf. The plan envisions an interlinked system of hike-bike trails, shoreline restoration projects, and urban parks in order to create Baltimore's green corridor. The plan envisions six mixed use redevelopment nodes at key waterfront parcels where a variety of public and private development proposals are already under discussion. These six opportunity areas can accommodate significant growth, which, according to the Baltimore City Department of Planning, include:

- 7,300 to 12,300 new households
- 13.1 to 21.1 million sq ft of space;
- 17,900 to 21,900 jobs located in smart growth areas;
- \$2.7 billion to \$4.1 billion in new investment.

The areas where development is projected include: Westport Waterfront Phase II, the Cherry Hill TOD zone, the National Aquarium's proposed environmental research center; Port Covington waterfront mixed use development area, and the Celebration Casino, already committed for the Gateway South area on the Upper Middle Branch.

Benefits

State of Good Repair

Two major interchanges serve the Westport Waterfront TOD. The bridge elements supporting these interchanges are severely deteriorated, structurally deficient and functionally obsolete, with Bridge Sufficiency Ratings (BSR) as low as 42.9. In addition there is an important pedestrian bridge that provides a key access point to the Westport Waterfront TOD across MD 295. All three bridges currently suffer from serious issues including deteriorated areas of concrete, heavy rusting, severe map cracking, and failing paint systems. The bridges are approaching the end of their service life and currently require the investment of significant funds to restore adequate long-term structural integrity. TIGER II funds will be used to replace the three bridges (Waterview Avenue over MD 295 (BC-5402), Annapolis Road over Waterview Avenue (BC-5407), and Maisel Street Pedestrian Bridge over MD 295 (BC-5001)) and reconstruct the ramp geometry to meet today's safety standards and strategically increase roadway capacity. A lifecycle cost analysis was conducted comparing the recurring cash outlays needed after reconstruction of the bridges versus those that would be required to maintain the bridges at their current level including performing significant concrete repairs, steel repairs, cleaning and painting, deck overlay/replacement, and traffic safety upgrades. The lifecycle cost analysis was based on the cost of maintaining the existing bridges, which would require a \$1.35 million investment every four years, versus the cost of maintaining the replacement bridges that would be built by the grant funds, which would require a \$1 million investment every ten years. A 40 year analysis period was assumed, which is conservative, given the expected service life of 70 to 100 years for new bridges. Over the 40 year analysis period, the total monetary benefit to State of Good Repair, based on the assumptions outlined above, would be \$3,401,887. See table 1-i.

Jobs and Economic Growth - Economic Distress and Low-mod Benefit (Economic Competitiveness) – Westport Phase I will generate 4,000 permanent jobs, 1,700 temporary construction jobs and a total direct and indirect economic output of \$1.8 billion, a massive stimulus for Baltimore as a distressed city that suffers high unemployment, high poverty rates, and a continuing erosion of the city’s manufacturing base. Westport Waterfront’s immediate neighbors - Westport, Mount Winans, Lakeland and Cherry Hill - are together some of the City’s most economically distressed areas. Of the roughly 15,000 residents, the current median household income in the area is \$28,665. Twenty-four percent of residents are living in poverty.¹

The developer and the community have formed the Westport Community Partnership, which is designed to maximize the positive benefits of the project for the surrounding community. Given these priorities, a conservative assumption is that the nearby residents of the distressed neighborhood will gain at least 5 percent of the temporary and permanent jobs and related earnings activities. This results in a projection of benefit to these under-served populations:

- 85 construction jobs
- 198 permanent jobs
- \$11.6 in household earnings (gross)
- \$1.3 million in net new earnings benefit, which has a 20-year net present value of \$13.6 million

The developer has also committed to 20 percent or 130 units of affordable housing. These low-moderate income households will gain from the same livability benefits as the other residents. For example, residents are projected to spend 40 percent less on transportation (relative to regional norms), which computes to \$4,800 saved per family annually. The 20-year net present value of these benefits for the 20 percent low-mod families is \$8.4 million See Table 1-a.

Jobs and Economic Growth – Gains for the US Economy (Economic Competitiveness) - While the majority of Westport Waterfront’s economic impacts will be regional (with particular benefits to distressed areas), some of the benefits are likely to be national, with gains in productivity and in attraction of businesses that represent US presence in the international economy.

There are three gains for the national economy, all linked to the established theory that mixed use/TOD/sustainable communities provide stimulating environments for work and that translates into economic gains.

- Knowledge spillover effect. There are productivity gains connected to urban density and what has been termed the “knowledge spillover” effect. Studies have linked increases in patents, as well as general worker productivity, to increasing density.
- Green buildings. Studies have also linked greater worker productivity to green buildings. Lower absenteeism, fewer building-related medical problems, as well as natural light contribute to worker productivity gains.
- International Businesses and Exporting Services. Many new economy businesses want to locate in stimulating mixed use environments, partly because these locations are appealing to their “creative class” workforce. Some of these businesses are international and are involved in exporting services - they can therefore be counted as net gains to the US economy. In Baltimore there are five such international companies that have been attracted to mixed use (non-downtown) waterfront locations. These five businesses provide a total of 2,200 jobs and comprise 20 percent of the non-downtown mixed use/waterfront office space.

¹ In the interest of brevity, sources are not cited in the summary – see the full cost-benefit analysis

The conservative conclusion is that Westport should be credited with at least a 1 percent increase in total output from a combination of efficiency gains and likely international export activity. The 20-year net present value of this 1 percent gain is \$348 million. See Table 1-b.

Lower VMTs and Lower Travel Costs (Economic Competitiveness and Livability). One finding is that Westport residents will reduce VMTs by 40 to 45 percent relative to regional norms. This conclusion follows a plethora of research on the relationship between density, TOD, mixing uses, mode splits, and VMTs all leading to the conclusion that it is exactly Westport-type development projects that correlate with the greatest VMT reduction.

The financial side of that equation is that residents of mixed use, walkable, and TOD communities spend significantly less on transportation than either the average American family or those living in auto-dependent outer suburban areas. One analysis, which took into account both fuel and auto ownership-related expenses, concluded that spending on transportation among those in “transit-rich” neighborhoods was 53 percent less than the average family and about 65 percent lower than the “auto-dependent ex-urbs.” If one assumes a more modest 40% reduction in transportation-related costs for Westport residents relative to the US average, Westport residents are projected to:

- Save \$4,750 per household on transportation costs relative to the US average;
- Save a total of \$3.8 million on transportation costs relative to the US average (represents 792 households).

The 20-year net present value of these travel cost savings is \$42.2 million. See Table 1-b. See Table 1-d.

Travel Times. (Economic Competitiveness and Livability) - Nationally, trips generated within mixed use communities average 17 percent “internal capture,” i.e. that 17 percent of all trips generated involve origin and destination within the mixed use community. For a project like Westport, the best assumption would be that nearly 100 percent of internal capture trips would be via walking and involve 5 to 10 minutes time. Urban trips, even those outside a mixed use zone, tend to be of shorter duration – the average trip in Baltimore City takes 18 percent less time than the regional norm.

Conservatively, Westport should be credited with lowering trip times by 15 percent. Applying this finding to residents’ commute times, results in the findings that:

- 40 hours gained annually per household (40 less hours commuting time)
- When time is monetized vis-à-vis the federal guidelines, the 20-year net present value of commuting time gained is \$5.5 million. See Table 1-g

Commute Trips “Saved” – Employees Commuting to Westport (Economic Competitiveness and Livability) – Limited national research leads to the conclusion that commuters to dense TOD-oriented mixed use employment centers also save VMTs relative to regional norms, but the reduction is somewhat less than for residents of those types of centers. For Westport the projection is a 30 to 35 percent savings relative to the norm. Using the lower end of that range, results in projections that

- Commuters to Westport jobs will save an average of 1,859 VMTs annually relative to regional norms;
- The monetized value of those “saved VMTs” is the value of gasoline saved. The 20-year net present value of gas saved by those commuting to Westport is \$14.1 million. See Table 1-c.

Property Value Increases (Economic Competitiveness and Livability). One measure of the livability benefits of a TOD walkable community is the higher property value associated with the convenience and

amenities gained. A comprehensive review of the literature concluded that the incremental increase in property value for TOD areas was between 10 and 20 percent. However, because the Westport proposed improvements are enhancements to an existing transit station, this analysis used a much more conservative 1 percent as the incremental increase in property value attributable to the proposed TIGER improvements. The 20-year net present value of a 1 percent gain in property values is estimated to be \$52.9 million.

Note that the land value increase has been “netted out” of the summary table of economic benefits because it may be duplicative of travel cost and time savings. See Table 1-h.

CO₂ Reduction due to VMT reduction (Sustainability) - Previously cited findings drew the conclusion that Westport residents would generate between 40 and 45 percent less VMTs and Westport employees would generate between 30 and 35 percent less VMT’s, both relative to Baltimore regional norms. Using a conversion factor of 0.437 metric tons of CO₂ per 1,000 miles driven leads to the following estimates of CO₂ “saved :”

- Westport households will generate 3.99 to 4.49 fewer metric tons of CO₂ from their travel activities, relative to regional norms
- Westport employees will generate 0.81 to 0.94 fewer metric tons of CO₂ from their commuting activities, relative to regional norms
- Using federal guidelines these CO₂ reductions have been monetized and a 20-year net present value of the reduced CO₂ is estimated to be \$2.2 million (calculated for the lower of end of the percentage reductions). See Table 1-d.

CO₂ Reduction due to Green Buildings. Westport Waterfront will require buildings to meet at least the LEED Silver requirements. Experience has shown that LEED Silver buildings will save energy at an average of 30 percent relative to conventional construction. For Westport Phase I, 1.9 million sq ft of space that meets the 30 percent energy reduction will save approximately 2, 829 metric tons of CO₂.

Total CO₂ Reduction. Adding together the VMT-related GHG savings with the green building efficiencies results in total CO₂ savings attributable to the greening elements of Westport Waterfront of between 9,220 and 10,154 metric tons CO₂ “saved” relative to norms.

Safety

Safety benefits were quantified based on the expected reduction in the number of vehicular crashes as a result of the development and associated improvements. The vehicular crash reduction is two-fold: first, a reduction in the existing crashes will be realized due to specific improvements constructed within the local roadway network and, second, benefits will be realized as a result of the mixed-use, transit oriented, urban nature of the proposed development which will result in a lower amount of total vehicular miles traveled generated by the development, compared to what would be expected in a typical suburban stand alone development of the same size (the regional norm).

The reduction in the existing number of vehicular crashes is a function of proposed improvements at several intersections around the development, details of which can be found in the full benefit cost document. Benefits based on these improvements were quantified using the *Desktop Reference for Crash Reduction Factors; Report No. FHWA-SA-08-011* which provides specific crash reduction factors based on the type of improvement. The expected number of reduced crashes per year was calculated and a total annual benefit was determined based on the average cost per crash at each intersection. Overall,

approximately 5.83 existing crashes would be eliminated annually, or about 117 crashes over a 20 year span, resulting in savings of \$2,585,882 over 20 years, discounted to present value.

The total number of crashes reduced as a result of the mixed-use, transit oriented, urban nature of the proposed development and the resultant reduction expected in the number of total vehicular miles traveled, compared to what would be expected in a typical suburban stand alone development of the same size (the regional norm) was also be considered as a benefit. Experts on the effects of this type of development have determined that the Westport Development would likely lead to a reduction of 14,942,216 annual vehicle miles traveled compared to regional norms. (*Westport Environmental and Energy Benefits Memorandum*) Based on the statewide average rates for fatality crashes (1.1 per 100 million vehicle miles traveled) and injury crashes (93.3 per 100 million vehicle miles traveled) an expected annual reduction in crashes due to the nature of the development was calculated. Based on the Department of Transportation's guidance on the value of life and injuries and assuming a seven percent discount rate, the total monetary benefit due to the mixed-use, transit oriented urban nature of the development would be \$24,480,902. The total number of crashes reduced over a twenty year period would be 3.2 fatality crashes, and 274 injury accidents.

The total monetary benefit due to the two types of crash reductions, existing and because of the nature of the development, is \$27,066,784, with a reduction of about 394 crashes expected over the 20 year analysis period. See Table 1-h.

No-Build Alternative

Lacking the infrastructure investments that are necessary to facilitate the Westport Waterfront project, the operative assumption would be that development will go to suburban sprawl development patterns.

From national research on smart growth and sprawl and from the analysis above, the following conclusions can be drawn.

- **Land Consumption.** Comparable suburban development would require a land area seven times the land area of Westport Phase I, i.e. 25 acres of previously used brownfield sites for Westport vs 175 acres of farmland or greenfields for suburban sprawl development;
- **Auto-dependence.** Where Westport has been projected to achieve a 30 percent non-auto mode share, Baltimore regional norms are 11.8 percent non-auto mode share, and suburban sprawl development can be assumed to be even lower.
- **Infrastructure Spending.** Most research points to higher infrastructure related spending needed to support sprawl development relative to compact urban development. One comprehensive review of the literature pegged the differential at between 20 and 50 percent. Another source analyzed Operations and Maintenance (O&M) costs for three alternative development patterns and found that O&M was 42 percent more costly in the spread development option relative to the most dense and centralized option. Thus, from a life cycle point of view, investing in Westport, as a dense urban walkable community, will reap rewards in long-term efficiencies.
- **VMTs and CO2.** The findings above conclude that Westport will reduce VMTs and CO2 by 40 – 45% relative to regional norms. The reverse would also be true – if development goes to sprawl patterns, VMTs and CO2 would be above regional norms.

- ***Inaccessible jobs.*** The alternative would also be that jobs would follow sprawl development patterns and go to less accessible locations without transit service. The residents of distressed areas in Baltimore City and near Westport would be far less likely to capture those jobs.
- ***Water Quality Worsens.*** EPA data indicates a strong correlation between low density and higher run-off - “With more dense development of eight houses per acre, runoff rates per house decrease by about 74 percent from one house per acre.”

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Summary of Economic Benefits, Westport Waterfront TOD Phase I				Economic Benefit Category	Monetized Net Benefit
Table 1-a. Regional and Distressed Area Impacts				Economic Distress	(not counted)
Total jobs and Economic Output - Westport Phase I, annual. These total impacts, although not national, will boost the economy of a distressed neighborhood in a distressed city.					
	office	retail	total		
Square feet	900,400	91,533	991,933		
Permanent jobs:					
- Total employees	3,782	173	3,955		
- Indirect jobs	6,583	25	6,608		
- Total direct and indirect jobs	10,364	197	10,561		
temporary jobs due to construction					
- jobs due to infrastructure			655		
- Jobs due to development			1,035		
- Total temporary jobs			1,690.00		
Direct earnings, annual	\$ 227,290,463	\$ 3,810,606	\$ 231,101,069		
Total earnings, annual	\$ 490,345,152	\$ 4,787,489	\$ 495,132,641		
Direct output, annual	\$ 1,089,075,513	\$ 7,497,849	\$ 1,096,573,361		
Total economic output, annual	\$ 1,740,236,142	\$ 10,192,938	\$ 1,750,429,081		
Distressed Area Benefit: Given that there are agreements in place to assure that residents of the distressed neighborhoods will gain access to both temporary and permanent jobs, a conservative assumption would be that residents will gain at least 5% of jobs and earnings					
Resident/distressed area temporary jobs due to construction					
- jobs due to infrastructure			33		
- Jobs due to development			52		
- Total temporary jobs			85		
Permanent Jobs gained by residents (5% of direct jobs)	189	9	198		
Earnings gained by residents (5% of direct earnings)	\$ 11,364,523	\$ 190,530	\$ 11,555,053		
positions assumed to be 10% of earnings gains	\$ 1,136,452	\$ 19,053	\$ 1,155,505		
20-year NPV of earnings gains, residents of distressed area			\$ 13,624,084		

Table 1-b. Benefits to the US Economy due to International Businesses/Exports and Productivity Gains in Westport Office Space, 20 years.		Economic Competitiveness	\$ 348,047,228
<i>A one percent gain in economic growth, net new to the US Economy, is projected from the Westport office sector: This comes from 3 factors: international businesses/service exporters; productivity gains due to density, and productivity gains due to green buildings</i>			
	Office		
Total earnings, 20 years, 2010 \$\$	\$ 98,069,030		
Direct Economic Output, 20 years. 2010 \$\$	\$ 217,815,103		
Total economic output, 20 years, NPV, 2010 \$\$	\$ 348,047,228		
Table 1-c. Employee Benefits of Reduced Commuting Costs (employees working at Westport)		Economic Competitiveness and Livability	\$ 14,105,051
<i>Employees working at Westport are projected to lower VMTs by 30 - 35% relative to regional norms. Using the lower 30% estimate results in:</i>			
VMTs "saved" per commuter, annual	1,850		
Aggregated VMTs "saved" by commuters annually relative to regional norms	7,236,979		
20-year NPV of fuel costs saved	\$ 14,105,051		
Table 1-d. Westport Resident HH Benefits of Lower VMTs and Lower Travel Costs		Economic Competitiveness and Livability	\$ 42,168,584
<i>Westport residents are projected to generate 40 - 45% lower VMTs relative to regional norms. Research indicates that residents of "transit rich" neighborhoods spend 53% less on travel relative to the US norm. Using a conservative 40% differential results in:</i>			
VMTs saved per HH, annual @40% reduction relative to regional norms	9,138		
VMTs saved, aggregated for Westport HH @40% reduction	\$ 7,236,979		
Resident HH \$\$ saved per HH, annual	\$ 4,750		
Aggregated \$\$ saved, all Westport HH, 20 year NPV in 2010 \$\$,	\$ 42,168,584		

Table 1-e. Lowered CO2 due to Fewer VMTs		Sustainability	\$ 2,221,667
<i>Westport residents are projected to generate 40 - 45% lower VMTs relative to regional norms and commuters to Westport businesses area projected to reduce VMTs by 30-35% relative to regional norms. Less driving directly correlates to lowered CO2 levels. using the lower end of both ranges results in:</i>			
Total VMTs saved, annually, Westport residents and commuters to Westport	14,631,587		
Lowered CO2 per HH, annual, Westport residents (metric tons)	3.99		
Lowered CO2 each commuter to Westport, annual, metric tons	0.81		
Aggregated lower CO2, all HH and commuters, annual, (metric tons)	6,391		
Monetized value of CO2 reduction, NPV, 2010 \$\$	\$ 2,221,667		
Table 1-f, Times saved due to "Internal Capture" and Lower Commute Times		Economic Competitiveness and Livability	\$ 5,546,306
<i>In a mixed use environment at least 17% of all trips are internally captured through short walking trips. Additionally, residents of Baltimore City average 18% shorter duration commute trips relative to regional norms. Using a conservative 15% reduction in travel times results in:</i>			
Time savings per HH Westport annually, hours	40.3		
Time savings all Westport HH - hours, annual	31,933		
Monetized value of time saved, 20 years, NPY, 2010 \$\$	\$ 5,546,306		
Table 1-g. Property Value Increases (as a measure of Livability)		Economic Competitiveness and Livability	\$ 52,863,205
<i>Literature indicates TOD areas gain 10 - 20% in property value over similar non-TOD areas. Because Westport is already transit-served and the TIGER improvements are enhancements, a conservative assumption would be that the enhancements will produce a 1 percent gain in property value</i>			
projected 2015 property values in 2010 \$\$	\$ 519,761,682		
1% attributable to TIGER infrastructure	\$ 5,197,617		
200-year NPV of 1% increase in property value	\$ 52,863,205		

Table 1-h, Safety Improvements		Safety	\$27,066,784
<i>Safety benefits are attributable to 1) direct results of intersection improvements; 2) VMT reduction in comparison to alternative development</i>			
Number of crashes reduced due to intersection improvements, annual	5.83		
Number of crashes reduced due to VMT savings in comparison to alternative development	13.7		
Annual fatal crashes reduced due to VMT savings in comparison to alternative development	0.16		
20-year VPV of reduction in crashes and fatalities due to both intersection improvements and VMT reduction	\$ 27,066,784		
Table 1-i State of Good Repair - Value of Avoided Maintenance		State of Good Repair	\$8,954,599
<i>The proposed project includes replacing structurally deficient, functionally obsolete bridge elements at three major MD 295 interchanges. There are avoided maintenance costs which constitute a net benefit of the project</i>			
20-year NPV of avoided maintenance costs on MD 295 bridge/interchanges	\$ 8,954,599		
Total Economic Benefit			\$514,597,508
Less Property Value Increase which may double-count travel cost savings and travel time savings			\$(52,863,205)
Less distressed area earnings benefit which is not net new to the US economy			\$(13,624,084)
Net Benefit to the US economy			\$ 448,110,219